

WHAT IS CLAIMED IS:

1. A method of manufacturing a surface acoustic wave apparatus, comprising the steps of:

preparing a piezoelectric substrate;

forming a first electrode layer of an electrode pad on the piezoelectric substrate;

forming at least one electrode for a surface acoustic wave element after the step of forming the first electrode layer;

forming a second electrode layer of the electrode pad after the step of forming the electrode for the surface acoustic wave element; and

forming a wiring electrode for electrically connecting the electrode pad and the electrode for the surface acoustic wave element.

2. The method according to Claim 1, wherein the wiring electrode is simultaneously formed with the second electrode layer.

3. The method according to Claim 1, further comprising the step of forming an adhesive layer as a substrate prior to the formation of the wiring electrode and the second electrode layer, wherein the wiring electrode and the second

electrode layer are made of one of Al and an Al alloy, and the adhesive layer is made of one of a metal or an alloy having an adhesion to the first electrode layer that is higher than that of the Al and the Al alloy.

4. The method according to Claim 1, further comprising the step of performing etching in order to form stepwise end surfaces at joint portions, to be connected with the wiring electrode, of the electrode for the surface acoustic wave element and the electrode pad, after the step of forming the electrode for the surface acoustic wave element, wherein the wiring electrode for electrically connecting the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad and the second electrode layer of the electrode pad are simultaneously formed from the same conductive film.

5. The method according to Claim 1, wherein each of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad includes at least two end surfaces of the joint portion.

6. The method according to Claim 1, wherein the electrode for the surface acoustic wave element to be connected with the electrode pad is formed such that the end

surface of the electrode for the surface acoustic wave element is in contact with the first electrode layer of the electrode pad in the step of forming the electrode for the surface acoustic wave element.

7. The method according to Claim 1, wherein a particle diameter of a conductive particle in the conductive film constituting the wiring electrodes and the second electrode layer is smaller than a particle diameter of a conductive particle in one of the electrode for the surface acoustic wave element and the first electrode layer, which has a smaller film thickness.

8. The method according to Claim 1, wherein the electrode for the surface acoustic wave element is formed by a lift-off method and the first electrode layer of the electrode pad is formed by etching.

9. The method according to Claim 1, wherein at least one electrode for a second surface acoustic wave element that is different from the electrode for the surface acoustic wave element is simultaneously formed with the first electrode layer in the step of forming the first electrode layer.

10. A surface acoustic wave apparatus, comprising:
a piezoelectric substrate;

at least one electrode for a surface acoustic wave
element disposed on the piezoelectric substrate;

an electrode pad disposed on the piezoelectric
substrate and arranged to be joined with a bump during a
bump bonding process performed by a flip chip bonding
system; and

a wiring electrode for electrically connecting the
electrode pad and the electrode for surface acoustic wave
element;

wherein the electrode pad includes a first electrode
layer disposed on the piezoelectric substrate and a second
electrode layer laminated on the first electrode layer, the
first electrode layer including an etched metal film, and
the at least one electrode for the surface acoustic wave
element including a material formed by a lift-off process.

11. The surface acoustic wave apparatus according to
Claim 10, wherein the wiring electrode and the second
electrode layer are integral with each other and include a
common metal film.

12. The surface acoustic wave apparatus according to
Claim 10, further comprising an adhesive layer defining a

substrate for the wiring electrode and the second electrode layer, wherein the wiring electrode and the second electrode layer are made of one of an Al and an Al alloy, and the adhesive layer is made one of a metal and an alloy having an adhesion to the first electrode layer that is higher than that of the Al and the Al alloy.

13. A surface acoustic wave apparatus, comprising:

a piezoelectric substrate;

at least one electrode for a surface acoustic wave element disposed on the piezoelectric substrate;

an electrode pad disposed on the piezoelectric substrate and arranged to be joined with a bump during a bump bonding process performed by a flip chip bonding system; and

a wiring electrode for electrically connecting the electrode pad and the electrode for the surface acoustic wave element, wherein:

the electrode pad includes a first electrode layer disposed on the piezoelectric substrate and a second electrode layer laminated on the first electrode layer;

the second electrode layer and the wiring electrode are integral with each and include the same conductive film; and

end surfaces of joint portions, to be electrically connected with the wiring electrodes, of the first electrode

layer and the electrode for the surface acoustic wave element are arranged to have a stepwise configuration.

14. The surface acoustic wave apparatus according to Claim 10, wherein each of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad includes at least two end surfaces of the joint portion.

15. The surface acoustic wave apparatus according to Claim 13, wherein each of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad includes at least two end surfaces of the joint portion.

16. A surface acoustic wave apparatus, comprising:
a piezoelectric substrate;
at least one electrode for a surface acoustic wave element disposed on the piezoelectric substrate;
an electrode pad disposed on the piezoelectric substrate and arranged to be joined with a bump during a bump bonding process performed by a flip chip bonding system; and
a wiring electrode for electrically connecting the electrode pad and the electrode for the surface acoustic

wave element, wherein:

the electrode pad includes a first electrode layer disposed on the piezoelectric substrate and a second electrode layer laminated on the first electrode layer;

the second electrode layer and the electrode for the surface acoustic wave element are integral with each other and include a common conductive film; and

the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad, to be connected with the electrode for the surface acoustic wave element, are arranged in contact with each other.

17. The surface acoustic wave apparatus according to Claim 10, wherein a particle size of a conductive particle in the conductive film constituting the second electrode layer and the wiring electrode is smaller than a particle diameter of a conductive particle in one of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad, which has a smaller film thickness.

18. The surface acoustic wave apparatus according to Claim 13, wherein a particle size of a conductive particle in the conductive film constituting the second electrode layer and the wiring electrode is smaller than a particle

diameter of a conductive particle in one of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad, which has a smaller film thickness.

19. The surface acoustic wave apparatus according to Claim 15, wherein a particle size of a conductive particle in the conductive film constituting the second electrode layer and the wiring electrode is smaller than a particle diameter of a conductive particle in one of the electrode for the surface acoustic wave element and the first electrode layer of the electrode pad, which has a smaller film thickness.

20. The surface acoustic wave apparatus according to Claim 10, wherein an electrode for a second surface acoustic wave element that is different from the electrode for the surface acoustic wave element is disposed on the piezoelectric substrate, and the electrode for the second surface acoustic wave element includes an etched metal film.

21. The surface acoustic wave apparatus according to Claim 13, wherein an electrode for a second surface acoustic wave element that is different from the electrode for the surface acoustic wave element is disposed on the

22. The surface acoustic wave apparatus according to Claim 15, wherein an electrode for a second surface acoustic wave element that is different from the electrode for the surface acoustic wave element is disposed on the piezoelectric substrate, and the electrode for the second surface acoustic wave element includes an etched metal film.